Presumptive Versus Directed Treatment Of Uncomplicated Malaria In Adult Malawians: Relative Costs

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INTRODUCTION

Presumptive treatment of uncomplicated febrile illnesses with antimalarial drugs is a recommended policy in most sub-Saharan African countries where there is intense transmission of P. falciparum.

The signs and symptoms of acute, uncomplicated malaria are clinically indistinguishable from those of other common illnesses (1). Diagnostic accuracy can be improved by determining the presence/absence of malaria parasites in the peripheral blood, but this approach requires a microscope, supplies and trained microscopists. The costs of screening are commonly thought to exceed the costs of presumptive treatment (2,3), but this assumption has not been tested in an adult outpatient setting in sub-Saharan Africa.

We compared the cost of presumptive treatment of uncomplicated malaria in adult Malawians with the costs of microscopic screening followed by treatment directed only to those individuals who were parasitaemic.

PATIENTS AND METHODS

This study was carried out in the Outpatients Department (OPD) of the Queen Elizabeth Central Hospital in Blantyre, Malawi. It consisted of four phases, each conducted during the third week (Monday-Saturday) of four successive months (January-April) of the main malaria transmission season.

Phase I: Daily tallies were made of all completed prescriptions in the OPD pharmacy, noting the total number of prescriptions as well as the number of prescriptions for antimalarial drugs. The normal OPD routine was not affected during this phase.

Phase II: Phlebotomists and microscopists were placed in the OPD and thick blood films were prepared for all patients for whom antimalarial treatment had been prescribed (Sulphamethoxazole/Pyremethamine (S/P) and an antipyretic in 99%). Thick films were stained with Fields stains and read using a 100x oil immersion lens. Every tenth slide was read by another experienced microscopist who was unaware of the initial interpretation. Prescriptions were completed irrespective of the blood film results. Prescribers in the OPD were aware of the screening process. Daily tallies in the Pharmacy were made as described above.

Phase III: Two weeks prior to Phase III, the results of Phase II were presented to the OPD prescribers in the context of a workshop on the clinical diagnosis of malaria. The process outlined for Phase II was then repeated and the effects of prescriber training were assessed.

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Phase IV: Procedures identical to Phases II and III were followed. OPD prescribers continued their usual practices, but the administration of specific antimalarial treatment (S/P, 3 tablets, stat, plus an antipyretic/analgesic) was restricted to parasitaemic patients. Those who were aparasitaemic were seen again by a the Medical Director of the OPD and were treated with antipyretic/analgesic agents only. They were encouraged to return if their symptoms did not improve within 48-72 hours.

RESULTS

The results in each of the four phases are in Table I.

Table 1.

PHASE	Total Scripts	Scripts for Anti-malarials	% Anti-malarial Scripts	Blood Films	Blood Films positive for MPs	% positive Blood Films
I	7216	2883	39.9%	—	—	—
II	5556	1171	21.1%	1174	344	29%
III	7054	1480	21.0%	1005	353	35%
IV	5377	357	6.6%	1170	347	30%

There were no statistically significant differences in the numbers of patients registered in the OPD (data not shown) or in the total number of prescriptions issued during Phases I, II, III and IV.

The proportion of all prescriptions which was for antimalarial treatment was highest (40%) during Phase I, dropped significantly during Phases II and III (to 20%) and dropped even further (to 7%) during Phase IV. There was no significant difference in this proportion between Phases II and III (before and after prescriber training).

The proportion of patients presumptively diagnosed with malaria who were actually parasitemic was approximately 30% in Phases II, III and IV. The differences between phases was not statistically significant.

Two MCE-level microscopists were able to manage the load generated each day. The discrepancies between their readings and those of other experienced microscopists was 2%.

COSTS OF MICROSCOPIC SCREENING

1. Staff (school leavers, specially trained)
   a. Two microscopists (MCE) at K300/month x 12 mos/yr: K7200/yr
   b. One phlebotomist (JCE) at K150/month x 12 mos/yr: K1800/yr
   Total staff: K9000/yr
2. Supplies (based on supplies consumed during Phases II-IV)

Cotton wool	K 41.00
EtOH	6.63
Immersion oil	62.00
Stains	27.40
Stationery	10.00
Lancets	174.00

K321.03/3349 slides read = 9t/slide
Slides: 11t per slide/3 uses = 4t/slide
Total supplies: 13t/slide

3. Annual cost of screening, assuming 1000 BFs/week (@13t/BF= K 130/week):
   K 130/week x 52 = K 6760 (supplies)
   K 9000 (salaries)
   K15760

COST SAVINGS WITH MICROSCOPIC SCREENING AND TREATMENT OF PARASITAEMIC PATIENTS ONLY

In Phase I, we determined that 40% of all prescriptions were for antimalarial drugs. This proportion dropped to 20% once the microscopists were placed in the OPD, but before receipt of antimalarial drugs was restricted to parasitaemic patients. The actual cost savings of microscopic screening should be determined using the original 40% figure.

In Phase IV, we determined that directed treatment of parasitaemic patients only reduced the antimalarial proportion of prescriptions dispensed to 7% of the total. The cost savings resulting from microscopic screening is the difference between the cost of providing antimalarials to 40% of the patients receiving prescriptions and the cost of providing antimalarials to only 7% of the patients receiving prescriptions. (This may result in an underestimate of the savings, because it may be that in the "dry season", the proportion of parasitaemic patients will be even lower.)

The cost to the QECH Pharmacy for one adult treatment dose of S/P (3 tablets) is 66 tambala.

Assume that 6300 prescriptions are written each week in OPDs 1 and 2 (this is the average based on the four weeks of our study):

Presumptive Rx:	6300 x 0.40 (40%) =	2520 Rxs for SP x 66t/Rx K 1663.20/wk
Directed Rx:	6300 x 0.07 (7%) =	441 Rxs for SP x 66t/Rx K 291.06/wk
Drug cost savings:	K1663.20 - K 291.06 =	K 1372.14/week x 52 weeks/yr K71351.28/year
Less yearly cost of screening:		K15760.00
TOTAL COST SAVINGS:		K55592.28

(2.7% of overall drug budget of K2,000,000/year)

DISCUSSION

This study demonstrates that, in the Queen Elizabeth Central Hospital out-patient setting, anti-malarial treatment directed by the microscopic detection of malaria parasites is more cost effective (by 82%) than presumptive treatment of uncomplicated adult malaria. The predicted annual cost savings are the equivalent of the annual yearly drug budget for the Dept of Orthopaedics (Chibwe RA, pers. comm.).

Records of antibiotics dispensed from the pharmacy during Phases II-IV and the week immediately following each phase did not demonstrate an increase in antibiotic or other prescriptions during the study weeks. It is therefore unlikely that more expensive "default" prescriptions would erode the cost savings realized by providing anti-malarial drugs only for those patients who are parasitaemic.

In malaria-endemic areas, individuals with acquired immunity to P. falciparum malaria may have malaria parasites in their blood and yet remain asymptomatic. Furthermore, since P. falciparum is only detectable in the peripheral blood for a portion of its life cycle, it is possible for an individual with malaria to be aparasitaemic at certain points during his/her infection. Therefore, a single negative blood film does not exclude the diagnosis of malaria and a positive blood film does not necessarily imply that the infected individual is ill because of his/her malaria infection. So, although the addition of microscopy improves diagnostic accuracy, blood film results must be interpreted carefully. Because P. falciparum infections in adult Malawians are rarely life-threatening, this degree of diagnostic uncertainty is acceptable. Young children, however, are at higher risk of developing severe and complicated malaria and in this age group, a stronger argument for the presumptive treatment of malaria can be made.

The degree of cost-savings depends upon the number of patients seen in any given setting, the proportion of those patients presumptively treated for malaria and the proportion of those presumptively treated who are parasitaemic and are thus recipients of directed treatment. Using the figures determined in this study (40% of all prescriptions written for presumptive treatment, 30% of those presumptively treated for malaria actually being parasitemic and thus receiving directed treatment), it is apparent that microscopic screening would be cost effective if more than one thousand patients are seen each week.

In addition to the cost savings associated with directed treatment of malaria, there are several other benefits:

1. Patients are spared the risks associated with the unnecessary administration of drugs.
2. Antimalarial drugs are dispensed more judiciously, thus slowing the development of drug resistance.
3. The pharmacy can monitor drug consumption more rigorously because a record can more easily be kept of patients "entitled" to receive antimalarial drugs.
4. A mechanism will be in place for monitoring the evolution of drug resistance in a patient population. Patients treated with the recommended drug will be known to have been parasitaemic upon initial receipt of the drug, and their blood film can be rechecked if they fail to improve clinically.

The findings of this study indicate that the cost savings associated with the directed treatment of malaria in the adult outpatients department of the Queen Elizabeth Central Hospital are significant and justify reconsidering the policy of presumptive treatment of malaria in this setting.

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